REMARKS

Claims 1-3, 11-14, 31-33, 41-44, 58-59, 61-62, 72-78, and 80-83 are all the claims presently undergoing examination in this application. By this amendment, various claims are amended. The amendments introduce no new matter.

It is noted that the claim amendments herein, if any, are made only to more clearly and completely define the invention and to assure grammatical and idiomatic English and improved form under United States practice, and are not made to distinguish the invention over the prior art, or for any statutory requirements of patentability. Further, Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1, 2, 14, 31-32, 44, 58, 62, 72, 74-76, 78, and 80-83 stand rejected under 35 U.S.C. §102(b) over Aggarwal (US 6,154,463). Claims 3, 11-13, 41-43, 59, 61, 73, and 77 stand rejected under 35 U.S.C. §103(a) over Aggarwal in view of Sistanizadeh, et al. (US 6,963,575) and Larsson, et al. (US Pat. App. Pub. No. 2003/0161268).

These rejections are respectfully traversed in the following discussion.

THE CLAIMED INVENTION

The claimed invention, as exemplarily described in the embodiment of independent claim 1, relates to a node in a network. The node configures a spanning tree over a network to which a plurality of nodes are connected. The configuration includes generating a new spanning tree and switching a spanning tree in use to the new spanning tree.

The new spanning tree is generated after a network configuration change. While the new spanning tree is generated, the node continues to operate only a spanning tree that existed before the network configuration change. The node switches a spanning tree to be

used for forwarding to the new spanning tree after the new spanning tree has not varied for a predetermined time.

The switching includes the node using, as the spanning tree to be used for forwarding, at most one of the new spanning tree and the spanning tree that existed before the network configuration change at any time.

The present invention provides a network system, a spanning tree configuration method, a spanning tree configuration node, and a spanning tree configuration program, having multiple advantages over the prior art. The present invention is capable of lowering the probability of occurrence of congestion and reducing the frequency with which delayed arrival or loss of frames occurs due to congestion. The present invention is capable of reconfiguring a spanning tree, such as performing addition/remove of a node that belongs to the spanning tree, without stopping the network. The present invention is capable of distributing the traffic load. The present invention is capable of distributing the load without stopping the network for spanning tree reconfiguration that accompanies a path change. In the present invention, a path with the minimum cost to a destination is selected. The present invention is capable of increasing the utilization ratio of a link, and distributing the load without concentrating the load in the vicinity of the root node. The present invention is capable of circumventing a network halt due to a root node failure. The present invention is capable of preventing the spanning tree from being set up by passing through the IEEE802.1D-using section, speeding up switching and route changes in the event of a failure, and reducing the possibilities of occurrence of congestion and loss of a frame.

THE PRIOR ART REJECTIONS

Applicant maintains the arguments of the previous Amendments. Some of those arguments are repeated below for the convenience of the Examiner.

The Aggarwal Reference

Claims 1, 2, 14, 31-32, 44, 58, 62, 72, 74-76, 78, and 80-83 stand rejected under 35 U.S.C. §102(b) over Aggarwal. Claims 3, 11-13, 41-43, 59, 61, 73, and 77 stand rejected under 35 U.S.C. §103(a) over Aggarwal in view of Sistanizadeh and Larsson.

Applicant respectfully traverses these rejections.

The Examiner alleges that certain features of the claimed invention are disclosed by Aggarwal. Applicant respectfully traverses these rejections. Applicant submits that there are features of the claimed invention which are neither disclosed nor suggested by Aggarwal.

Aggarwal fails to disclose or suggest at least "A node that configures a spanning tree over a network to which a plurality of nodes are connected, comprising: means for generating a new spanning tree after a network configuration change while continuing to operate only a spanning tree that existed before the network configuration change, and means for switching a spanning tree to be used for forwarding to said new spanning tree only after said new spanning tree has not varied for a predetermined time, said switching comprising said node using at any time, as said spanning tree to be used for forwarding, at most one of said new spanning tree and said spanning tree that existed before the network configuration change," as recited in independent claim 1. The remaining claims recite similar features, and Applicant traverses their rejections on substantially similar bases.

In Aggarwal, the packet is transmitted to both the old tree and the new tree by

"Dualcast Mode" on the occasion of a switching to a new tree, as indicated at least in the SUMMARY OF THE INVENTION section, and generally. "*Consequently, as membership to a discussion group changes and the CO Steiner tree in use is no longer close to optimum, the multicast session is continued on a revised CO Steiner tree by using a dualcast mode during a changeover to a newly computed CO Steiner tree. The dualcast mode reliably transmits packets using two different Steiner trees for the multicast session and minimizes any loss of quality of the multicast communication caused by dropped or delayed packets.*" Aggarwal, col. 3, lines 35-45.

With the present invention, in sharp contrast, switching from transmission on the old tree to transmission on the new tree is performed after the stability of the new tree is established. Thus, simultaneous transmission to both trees is not performed.

Thereby, the present invention provides the advantage that there is little wasteful traffic. Further, the present invention thereby provides high use efficiency of resources.

The Examiner alleges that Aggarwal discloses certain features of the claims at col. 14, lines 54-65, and col. 15, lines 8-9.

However, the cited reference discloses only, "*Computation of proposed trees is done synchronously with other activities, and can be done as a background process. The recomputed CO Steiner tree is referred to herein as the proposed Tree(G). If the difference between the two trees exceeds a predetermined threshold, then GR(G) initiates a switch tree operation for switching from the current Tree(G) to the proposed Tree(G). Although join and leave operations can be acknowledged during a switch tree operation, only the situation where join and leave operations are queued until the switch tree operation will be completed is described.*" Aggarwal, col. 14, lines 54-65. "*Once the new CO Steiner Tree computation*

is complete, GR effects the switch from the current tree." Aggarwal, col. 15 lines 8-9.

However, Aggarwal fails to disclose or suggest the features recited in the claims. In particular, Aggarwal fails to teach or suggest at least the features "switching a spanning tree to be used for forwarding to said new spanning tree only after said new spanning tree has not varied for a predetermined time" and "said switching comprising said node using at any time, as said spanning tree to be used for forwarding, at most one of said new spanning tree and said spanning tree that existed before the network configuration change." Independent claims 31, 58, 72, and 80 recite similar features. Applicant traverses the rejections of claims 2, 31-32, 58, 72, and 80-83 on substantially similar basis.

Aggarwal fails to disclose or suggest wherein the node switches from a spanning tree to be used for forwarding to said new spanning tree only after said new spanning has not varied for a predetermined time. This is the definition of a "stable" spanning tree, as defined in the Specification at least at p. 72, line 25 – p. 73, line 1, and generally.

Instead, and as quoted above, Aggarwal teaches switching from a current Tree(G) to a proposed Tree(G) whenever there is sufficient difference indicating change between the two, without regard to whether such changes have settled to a stable configuration. *"If the difference between the two trees exceeds a predetermined threshold, then GR(G) initiates a switch tree operation for switching from the current Tree(G) to the proposed Tree(G)."* Aggarwal, col. 14, lines 58-61.

Further, in the present invention, switching involves a selection of a spanning tree used for forwarding. However, only one such spanning tree is used by any node at any time. This feature is now recited explicitly in the claims, "said switching comprising said node using at any time, as said spanning tree to be used for forwarding, at most one of said new

spanning tree and said spanning tree that existed before the network configuration change."

Aggarwal, on the other hand, discloses, "*Once the new CO Steiner Tree computation is complete, GR effects the switch from the current tree. During the transition to the new tree, routers are forwarding messages on both the current and the proposed tree links, thus providing fault-tolerance for incorrectly propagated packets during the transition period. This aspect of the present invention is a dualcast operation because the session is multicasted on two separate Steiner trees. A true Dualcast, such as disclosed by Aggarwal et al., supra, can operate at the application level for additional reliability.*" Aggarwal, col. 15, lines 8-17.

Thus, Aggarwal fails to disclose or suggest at least these features of the claims.

With further regard to claims 14, 44, 62, and 78, Aggarwal fails to disclose or suggest at least the feature "means for generating a spanning tree in which each node in the network serves continually as a root node," as recited in the claims.

The Examiner alleges only that, "*(CSM protocol provides symmetric multicast capability, that is, group communication with any node of a group, with each node able to be either a sender or a receiver), and forwarding a frame using a spanning tree in which the destination serves as a root node (column 4, lines 45-65; summary).*" Office Action, p. 3.

Applicant submits that a symmetric multicast capability, with each node able to be either a sender or a receiver, fails to disclose or suggest the recited feature of a spanning tree in which each node in the network serves continually as a root node. Applicant submits that the features of the present invention and of Aggarwal are clearly distinct from each other, in that one skilled in the art would understand that nodes which do not serve continually as root nodes are not thereby inherently incapable of being a sender or a receiver.

Further, Aggarwal fails to disclose or suggest each node calculating such a spanning

tree for the network. Instead, Aggarwal discloses that only the gatekeeper router calculates the Steiner tree, and only the gatekeeper router is responsible for updating the Steiner tree. "*Only the Gatekeeper Router GR(G) computes the Steiner tree and is responsible for subsequent updates of the Steiner tree. For each group G, there is a GR(G), but any multicast router can be a GR(G).*" Aggarwal, col. 10, lines 5-8. If the gatekeeper router fails, only a designated backup can take over the function of the gatekeeper router. "*A backup Gatekeeper Router GRB(G), such as multicast router R_6, can be used for additional reliability by taking control of the group from a current GR(G) in the event that the current GR(G) crashes.*" Aggarwal, col. 9, lines 36-39. Aggarwal lacks an ability for each node in the network to calculate such spanning trees itself. Further, if no such backup gatekeeper router GRB(G) is designated, then a failure of the gatekeeper router GR(G) would prevent the system of Aggarwal from functioning. Thus, only one such unique gatekeeper router GR(G) can function as a gatekeeper router in Aggarwal at any time.

Thus, Aggarwal fails to disclose or suggest at least these features of the claims.

Therefore, Applicants respectfully request the Examiner to reconsider and withdraw the rejection of all claims over Aggarwal or over Aggarwal in view of Larsson.

CONCLUSION

In view of the foregoing, Applicant submits that claims 1-3, 11-14, 31-33, 41-44, 58-59, 61-62, 72-78, and 80-83, all the claims presently undergoing examination in the application, are patentably distinct over the prior art of record and are allowable, and that the application is in condition for allowance. Such action would be appreciated.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned attorney at the local telephone number listed below to discuss any other changes deemed necessary for allowance in a telephonic or personal interview.

To the extent necessary, Applicant petitions for an extension of time under 37 CFR §1.136. The Commissioner is authorized to charge any deficiency in fees, including extension of time fees, or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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